AMENDED CLAIMS

[Received by the International Bureau on 12 January 2005 (12.01.05): original claims 1-34 replaced by amended claims 1-34 (10 pages)]

Having thus described the invention, what is claimed as new and secured by Letters Patent is:

1. A sensor cable for use in an intrusion detection system having a processor, the sensor cable having an input and an output, both the input and the output of the sensor cable for coupling to the processor, the sensor cable comprising:

a first electrically conductive cable member;

a second electrically conductive cable member;

an air separator and a plastic electrically insulating member both being disposed between the first conductive cable member and the second conductive cable member;

the first electrically conductive cable member having one surface in contact with the air separator and being freely movable within the air separator relative to the plastic electrically insulating member; and

the plastic electrically insulating member being made of a material selected based on triboelectric series properties and being processed such that the cable is capable of producing a terminal voltage with acceptable signal to noise ratio in response to a disturbance.

2. A sensor cable as in claim 1, wherein the terminal voltage is produced based on triboelectric effect.

3. A sensor cable as in claim 1, wherein the terminal voltage is produced based on electret effect.

4. A sensor cable as in claim 1, wherein the terminal voltage is produced based on triboelectric and electret effects.

5. The sensor cable as in claim 1, wherein the sensor cable is a coaxial cable, and wherein the first electrically conductive cable member encloses the second electrically conductive cable member.

6. The sensor cable as in claim 1, wherein the sensor cable is a coaxial cable, and wherein second electrically conductive cable member encloses the first electrically conductive cable member.

7. The sensor cable as in claim 1, wherein the sensor cable is a coaxial cable, wherein second electrically conductive cable member encloses the first electrically conductive cable member,
and wherein the sensor cable further includes an outer jacket and a second air separator, such that the second air separator is disposed between the outer jacket of the sensor cable and the plastic electrically insulating member, and wherein the second electrically conductive member has one surface in contact with the second air separator and being freely movable within the second air separator relative to the plastic electrically insulating member.

8. The sensor cable as in claim 1, wherein the cable is a coaxial cable, and wherein the surface of the first electrically conductive member is coated with a dielectric layer.

9. The sensor cable as in claim 1, wherein the cable is a twisted pair cable, wherein the plastic electrically insulating member is a plastic coating on the first electrically conductive member, and wherein the plastic

coating is twisted with the second electrically conductive member.

10. The sensor cable as in claim 1, wherein the plastic electrically insulating member is selected from the group consisting of: polyvinyl chloride, polyethylene, foamed polyethylene, and polypropylene.

11. The sensor cable as in claim 1, wherein the cable is a threadless radio grade (RG) coaxial type cable.

12. The sensor cable as in claim 1, wherein the acceptable signal to noise ratio is at least an order of magnitude larger than the noise averaged over a period of time.

13. An integrated sensor cable for use in an intrusion detection system having a processor, the sensor cable having an input and an output, both the input and the output of the sensor cable for coupling to the processor, the integrated sensor cable comprising:

a first electrically conductive cable member;

a second electrically conductive cable member;

an air separator and an plastic electrically insulating member both being disposed between the first conductive cable member and the second conductive cable member;

the first electrically conductive cable member having one surface in contact with the air separator and being freely movable within the air separator relative to the plastic electrically insulating member, to provide an impedance change in response to a disturbance; and

the plastic electrically insulating member being made of a material selected based on triboelectric series

properties and being processed such that the cable is capable of producing a terminal voltage with acceptable signal to noise ratio in response to the disturbance.

14. The integrated sensor cable as in claim 13, wherein the cable is a coaxial cable, and wherein the first electrically conductive cable member encloses the second electrically conductive cable member.

15. The integrated sensor cable as in claim 13, wherein the cable is a coaxial cable, and wherein second electrically conductive cable member encloses the first electrically conductive cable member.

16. The integrated sensor cable as in claim 13, wherein the cable is a coaxial cable, and wherein the surface of the first electrically conductive member is coated with a dielectric layer.

17. The integrated sensor cable as in claim 13, wherein cable is a twisted pair cable, and wherein the plastic electrically insulating member is twisted together with the second electrically conductive member.

18. The integrated sensor cable as in claim 13, wherein the plastic electrically insulating member is selected from the group consisting of: polyvinyl chloride, polyethylene, foamed polyethylene, polypropylene, and fluoropolymers.

19. The integrated sensor cable as in claim 13, wherein the cable is a threadless radio grade (RG) type cable.

20. The integrated sensor cable as in claim 13, wherein the acceptable signal to noise ratio is at least an order of magnitude larger than the noise averaged over a period of time.

21. A method of manufacturing an integrated sensor cable for use with an intrusion detection system, comprising steps of:

a) selecting materials for construction of a coaxial cable, the coaxial cable having a first electrically conductive cable member, a second electrically conductive cable member, and an air separator, a threaded member, and an plastic electrically insulating member, the air separator, the threaded member, and the plastic electrically insulating member being disposed between the first conductive cable member and the second conductive cable member, and the threaded member being wound around the first cable member to prevent movement of the first cable member within the air separator, relative to the insulating member; and

b) altering the construction to omit the threaded member from the manufacturing method to form a threadless coaxial cable, the first electrically conductive cable member having one surface in contact with the air separator and being freely movable within the air separator relative to the plastic electrically insulating member, and the plastic electrically insulating member being made of a material having suitable triboelectric series properties and being processed such that the threadless coaxial cable is capable of producing a terminal voltage with acceptable signal to noise ratio in response to a disturbance.

22. The method of manufacturing as in claim 21, wherein the standard coaxial cable selected in step a) is a threaded radio grade (RG) cable.

23. A method of manufacturing an integrated sensor cable for use with an intrusion detection system, comprising steps of:

a) selecting materials for construction of a coaxial cable, the coaxial cable having a first electrically conductive cable member, a second electrically conductive cable member, and an air separator, a threaded member, and an plastic electrically insulating member, the air separator, the threaded member, and the plastic electrically insulating member being disposed between the first conductive cable member and the second conductive cable member, and the threaded member being wound around the first cable member to prevent movement of the first cable member within the air separator, relative to the insulating member; and

b) altering the construction to omit the threaded member from the manufacturing method to form a threadless coaxial cable, the first electrically conductive cable member having one surface in contact with the air separator and being freely movable within the air separator relative to the plastic electrically insulating member, to provide an impedance change in response to a disturbance, and the plastic electrically insulating member being made of a material having suitable triboelectric series properties and being processed such that the de-threaded coaxial cable is capable of producing a terminal voltage with acceptable signal to noise ratio in response to the disturbance.

24. The method of manufacturing as in claim 23, wherein the coaxial cable selected in step a) is a threaded radio grade (RG) cable.

25. The method of manufacturing as in claim 24, further including the step of coupling the threadless coaxial cable to the intrusion detection system for use as a sensing element in the intrusion detection system.

26. A passive intrusion detection system comprising:

a cable having a first electrically conductive cable member, a second electrically conductive cable member, and an air separator and an plastic electrically insulating member both being disposed between the first conductive cable member and the second conductive cable member, the first electrically conductive cable member having one surface in contact with the air separator and being freely movable within the air separator relative to the plastic electrically insulating member, and the plastic electrically insulating member being made of a material selected based on triboelectric series properties, and being processed such that the coaxial cable is capable of producing a terminal voltage with acceptable signal to noise ratio in response to a disturbance; and

a processor, operatively coupled to the cable, for generating a signal in response to the terminal voltage produced from the cable in order to detect the disturbance.

27. The intrusion detection system as in claim 26, wherein the plastic electrically insulating member is selected from the group consisting of: polyvinyl chloride, polyethylene, foamed polyethylene, and polypropylene.

28. An active intrusion detection system comprising:

a cable having a first electrically conductive cable member, a second electrically conductive cable member, and an air separator and an plastic electrically insulating member both being disposed between the first conductive cable member and the second conductive cable member, the first electrically conductive cable member having one surface in contact with the air separator and being freely movable within the air separator relative to the plastic electrically insulating member, to provide an impedance change in response to a disturbance, and the plastic electrically insulating member being made of a material selected based on triboelectric series properties such that the cable is capable of producing a terminal voltage with acceptable signal to noise ratio in response to the disturbance; and

a processor, operatively coupled to the cable, for propagating an injected signal into the cable and receiving a reflected signal altered by the impedance change along the cable, and locating the disturbance based on a timing differential between the reflected signal relative and the injected signal.

29. The intrusion detection system as in claim 28, wherein the plastic electrically insulating member is selected from the group consisting of: polyvinyl chloride, polyethylene, foamed polyethylene, polypropylene, and fluoropolymers.

30. An intrusion detection system comprising:

a cable having a first electrically conductive cable member, a second electrically conductive cable member, and an air separator and an plastic electrically insulating member both being disposed between the first conductive

cable member and the second conductive cable member, the first electrically conductive cable member having one surface in contact with the air separator and being freely movable within the air separator relative to the plastic electrically insulating member, to provide an impedance change in response to a disturbance, and the plastic electrically insulating member being made of a material selected based on triboelectric series properties and being processed such that the cable is capable of producing a terminal voltage with acceptable signal to noise ratio in response to the disturbance; and

a processor, operatively coupled to the cable, for propagating, in an active state, an injected signal into the cable and receiving a reflected signal altered by the impedance change along the cable, and locating the disturbance based on a timing differential, and for generating a signal, in a passive state, in response to the terminal voltage produced from the cable in order to detect the disturbance.

31. The intrusion detection system as in claim 30, wherein the plastic electrically insulating member is selected from the group consisting of: polyvinyl chloride, polyethylene, foamed polyethylene, polypropylene, and fluoropolymers.

32. The intrusion detection system as in claim 30, further including switching means operatively coupled to the processor for alternating in a time sequence between the passive state and the active state.

33. The intrusion detection system of claim 30, further including switching means operatively coupled between the processor and the cable to form a connection

path to the cable, and a time domain reflectometer, operatively coupled to the processor and the switching means, for propagating an injected signal into the cable and receiving a reflected signal altered by the impedance change along the cable, wherein the switching means is capable of opening and closing the connection path to the cable.

34. The intrusion detection system as in claim 30, wherein the processor is a microprocessor based signal processor.